



NOAA SCIENTIFIC PUBLICATIONS REPORT

NOVEMBER 2 - NOVEMBER 15, 2012

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1. HIGHLIGHTED ARTICLES

1a. Title: The role of eelgrass in marine community interactions and ecosystem services: Results from ecosystem-scale food web models

Journal: Ecosystems

Authors: M. L. Plummer, C. J. Harvey, L. E. Anderson, A. D. Guerry, and M. H. Ruckelshaus (NMFS NWFSC)

Significance:

- This paper is a significant leap forward in our ability to connect ocean users' values with measurable ecosystem services and provide a way to measure our progress towards set targets.
- Using an ecosystem services framework, our results show that the values of most services are positively linked to changes in eelgrass area.
- In a management context, the one discordant result of declines in bird watching can be explicitly weighed against the likely increases in the other service categories.
- This kind of information gives management bodies a method for clearly illustrating the potential tradeoffs inherent in ecosystem-based management and facilitates a transparent resolution of such conflicts.



Summary: Using a food web modeling approach, we show that the direct and indirect ecological consequences of increases in nearshore habitats such as eelgrass can lead to greater biomass of many invertebrate, fish and bird species that depend on those habitats for refuge or food. We also illuminate a few unexpected species changes, including decreases in some forage fish and bird species due to competition or changes in predator-prey dynamics. These results illustrate the value of combining habitat-food web models with economic models and provide evidence of the dangers of relying solely on expert judgment to predict changes in benefits flowing from ecosystems under different conditions.

Acceptance Date: September 14, 2012



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1b. Title: Long-term ozone trends at rural ozone monitoring sites across the United States, 1990-2010

Journal: Journal of Geophysical Research

Authors: O. Cooper (OAR/CIRES), R.-S. Gao (OAR/ESRL), D. Tarasick, T. Leblanc, C. Sweeney (OAR/CIRES)

Significance:

- **In the U.S. West, imported pollution from Asia may be partially counteracting successful U.S. efforts to reduce ozone pollution.**
- The authors accounted for the potential influences of changing temperatures out West, wildfire and changes in many anthropogenic emissions.

Summary: The authors find significant differences in ozone pollution trends in rural areas of the U.S. East vs. West over the past 20 years, and the differences are consistent with increased levels of pollution imported into the West from across the Pacific Ocean. The research team evaluated ozone pollution trends at rural U.S. sites. They used all available data (eg, highest, lowest and median levels, from all sites with data from 1990-2010 during spring summer and winter) instead of the data subsets more commonly analyzed (eg, annual 4th highest of daily 8-hr maximum). This approach provided broader regional results, seasonal information, and insight into whether changes were occurring at the high, middle, or low ends of the ozone measurements. Overall, the scientists found that the highest levels of ozone pollution dropped at many rural eastern sites, due to declining emissions of the chemicals that contribute to ozone formation. Emissions have also declined in the West, leading to fewer extreme ozone pollution events in many Western cities. However, in rural areas of the West, ozone trends tended to be steady or increasing, with the strongest increases occurring in spring. Many model analyses indicate that decreasing U.S. emissions should reduce ozone in both regions. Trends in the West are inconsistent with these model studies, but consistent with the potential impact of increasing baseline ozone flowing into the U.S. West from across the North Pacific Ocean.

Expected Publication Date: November 2012.

Rollout Plan: Under consideration, possibly to include pitch calls to targeted journalists and OAR web story.



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- 1c. Title of paper:** Ecosystem size structure response to 21st century climate projection: large fish abundance decreases in the central North Pacific and increases in the California Current

Journal: Global Change Biology

Authors: P. A. Woodworth-Jefcoats, J. J. Polovina (PIFSC NMFS); J. P. Dunne (NOAA GFDL); J. L. Blanchard

Significance:

- Changes in fish stock productivity and potential fishery yield driven by climate change will have socio-economic impacts on the fishing community.
- Continued research and monitoring are needed to confirm the model projections.
- Managers and fishery constituents should plan for change and evaluate strategies to maintain sustainable fisheries in the face of declining stock productivity.

Summary: Output from an earth system model was paired with a size-based food web model to investigate the effects of climate change on the abundance of large fish over the 21st century. Size structure of the phytoplankton community was a better indicator of the abundance of large fish than other common indicators of ocean productivity, such as temperature, primary production, or chlorophyll concentration, and can be used as an indicator of overall ecosystem productivity.

Over the 21st century, climate-driven changes in phytoplankton size structure are projected to alter catches of large fish in the North Pacific. Catch is expected to decline by 75.8% at the boundary of the subtropical biome, to decline by 18.8% within the subtropical biome, and to increase by 43.0% in the California Current region. Thus, studies that address only climate-induced impacts to primary production without including changes to phytoplankton size structure may not adequately project ecosystem responses.

Expected publication date: Early 2013 (see attached)

Roll out plan: PIFSC Twitter



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1d. Title: U.S. Temperature and Drought: Anomalies of Spring and Summer 2011-2012 and Trends

Journal: *Eos* American Geophysical Union

Authors: T. R. Karl, B. E. Gleason, M. J. Menne, J. R. McMahon, R. R. Heim, M. J. Brewer (NESDIS/NCDC); K. E. Kunkel (Cooperative Institute for Climate and Satellites –North Carolina); D. S. Arndt, J. L. Privette, J. J. Bates (NESDIS/NCDC); P. Y. Groisman (UCAR/NCDC); D. R. Easterling (NESDIS/NCDC)

Significance:

- With increasing temperatures expected in the long term, the amplifying feedbacks of higher temperature extremes and dry conditions are likely to magnify both temperature extremes and drought severity in the United States.

Summary: The spring and summer (March through August) of 2011-12 set many new climatological records across the contiguous U.S., including the hottest month in the instrumental record, July 2012. In this article, various measures of temperature extremes and drought severity are used to put this period into historical perspective (1895 to present) and to assess to what extent the recent anomalies are consistent with observed trends. During spring and summer, anomalously high temperatures can combine with unusually dry conditions to amplify temperature and drought feedbacks. Observational data are strongly suggestive of such an amplification and reveal a number of significant trends for various measures of high temperatures in the U.S.

Expected Publication Date: November 20, 2012



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1e. Title: Assessing coral reef fish population and community changes in response to marine reserves in the Dry Tortugas, Florida USA

Journal: Fisheries Research, Special Issue: Marine Protected Areas

Authors: J. S. Ault, S. G. Smith, **J. A. Bohnsack**, J. Luo, N. Zurcher, **D. B. McClellan**, T. A. Ziegler, D. E. Hallac, M. Patterson, M. W. Feeley, **B. I. Ruttenberg**, J. Hunt, D. Kimball, B. Causey (**NMFS SEFSC**)

Significance:

- Results support predictions of marine reserve theory and indicate that **no-take marine reserves in conjunction with traditional fishery management control strategies are helping to build sustainable fisheries** while protecting the fundamental ecological dynamics of the Florida Keys coral-reef ecosystem.
- Fishery independent visual monitoring of coral reefs in the Dry Tortugas region of Florida provided precise population data for a large number of fishery targeted and non-target species.
- Significant changes in species composition, abundance, and size of coral reef fishes were detected within different management zones over 10 years.
- Abundance and size of targeted reef fish species was directly correlated to the level of protection from fishing.
- Results demonstrate management effectiveness and show the value of long-term, fishery-independent coral reef monitoring for marine spatial assessment and planning.

Acceptance Date: October 3, 2012



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2. ADDITIONAL ARTICLES

2a. Title: NOAA's 1981-2010 U.S. climate normals: an overview

Journal: Bulletin of the American Meteorological Society

Authors: A. Arguez, I. Durre, S. Applequist, R. Vose, M. Squires, R. Heim, Jr., T. Owen, Xungang Yin (NESDIS/NCDC)

Significance:

- Results are consistent with substantial observational evidence that the climate has warmed.

Summary: The latest 30-year U.S. Climate Normals, available from the National Climatic Data Center, were calculated for over 9,800 weather stations and include several new products and methodological enhancements. This latest decadal installment features thousands more stations and improved calculations. The new values suggest a +0.5°F difference between 1981-2010 and 1971-2000 in accordance with observed warming, as well as regional differences in precipitation differences.

Expected Publication Date: November 2012 (see attached)



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2b. Title: *Calibration and quality assurance of flux observations from a small research aircraft*

Journal: Journal of Atmospheric and Oceanic Technology

Authors: O. S. Vellinga, **R. J. Dobosy**, **E. J. Dumas**, B. Gioli, J. A. Elbers, R. W. A. Hutjes (OAR/ARL)

Significance:

- Confirms that calibration for flux measurement can rely primarily on theory with minor adjustments in flight.
- Extensive wind-tunnel work specific to each system appears unnecessary. Fluxes can be confidently measured along straight and level flight legs, as has been the standard protocol.

Summary: Air-surface exchange, a major component of greenhouse-gas budgets, is routinely measured from fixed surface sites and, increasingly airborne systems, especially those involving small aircraft. The Sky Arrow 650 ERA is explicitly optimized for high-precision airborne turbulence measurement and is used by multiple groups worldwide. Its Best Airborne Turbulence (BAT) probe has an unusual nine-port design developed by NOAA's Air Resources Laboratory. This paper describes the results of careful in-flight calibration of the Sky-Arrow/BAT-probe system and presents analysis techniques including methods of quality control and assurance for the resultant fluxes.

Expected publication date: March 2013



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2c. Title: Nutrient dynamics in coastal lagoons and marine waters of Vieques, Puerto Rico

Journal: Tropical Conservation Science

Authors: D. Whitall, A. Mason, A. Pait (NOS/NCCOS)

Significance:

- These data provide evidence that conservation efforts to preserve the ecology of the coastal waters of Vieques are succeeding.
- The elevated nutrient concentrations observed are hypothesized to be the natural status of the system, rather than evidence of eutrophication.

Summary: Determining the efficacy of efforts to conserve natural systems requires that environmental baseline data exist; without such baseline data, it is impossible to determine if management actions are working. This study presents water quality baseline data (nutrients) for the coastal waters of the island of Vieques, Puerto Rico. As the island's economy shifts more towards tourism, these data can be used to verify that conservation efforts to preserve the ecology of the coastal waters are succeeding. Surface waters were sampled at 40 sites, selected using a stratified random sampling design, on 7 occasions between July 2007 and March 2008. Nutrient concentrations were similar to what has been observed in other systems in Puerto Rico, except for in the near coastal lagoons which had significantly higher observed concentrations. Variations in nutrients between lagoons are driven by connectivity to the ocean and lagoon depth. Because of these relationships, and because there are no obvious major sources of point or non-point sources of pollution on the island that would affect only the lagoons, it is hypothesized that these high nutrient levels are the natural status of the system, rather than evidence of eutrophication.

Expected publication date: December 2012



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2d. Title: A high latitude coral community with an uncertain future: Stetson Bank, northwestern Gulf of Mexico

Journal: Coral Reefs

Authors: J. L. DeBose, M.F. Nuttall, E.L. Hickerson, G.P. Schmahl (NOS- ONMS)

Significance:

- The authors present an analysis of 15 years of monitoring data spanning from 1993 to 2008 at Stetson Bank, in the Gulf of Mexico
- This dataset provides both a biological baseline and a multiyear trend analysis of the community structure for a high-latitude coral-sponge community in the face of changing climatic conditions.
- Over the course of the monitoring, a major shift in community structure occurred, in which the coral-sponge community was replaced by an algal-dominated community through natural (e.g., storms) and anthropogenic (e.g., runoff; elevated SSTs) stressors.

Summary: Limited data exist that detail trends in benthic community composition of high-latitude coral communities. As anthropogenic stressors are projected to increase in number and intensity, long-term monitoring datasets are essential to understanding community stability and ecosystem resilience. Over the course of this monitoring, a major shift in community structure occurred, in which the coral-sponge community was replaced by an algal-dominated community, through the combined effects of coastal runoff and elevated temperatures. Prior to 1999, the benthic community of Stetson Bank was generally resilient (i.e., high coral cover). In future years (~2005-06) the reef-sponge dominated ecosystem shifted to a near total dominance of microalgae due to high SST and severe tropical storms.

Monitoring efforts are ongoing, and further analysis will determine if this community shift is a permanent or reversible one.

Publication Date: October 25, 2012



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2e. Title: Reexamining the warming in the tropical upper troposphere: Models versus radiosonde observations

Journal: Geophysical Research Letters

Authors: D. J. Seidel, M. P. Free, and James S. Wang (OAR ARL)

Significance: Radiosonde observations and satellite data have different vertical resolutions and different error characteristics. As a result, they reveal aspects of tropical tropospheric temperature trends and may lead to different conclusions when compared with model simulations. These differences highlight challenges of using imperfect observations of tropical tropospheric temperature over a few decades to assess climate model performance. The study contributes to a large body of literature on vertical profiles of temperature trends, a topic of major controversy in recent decades, and highlights observational challenges to resolving the remaining controversies regarding trends in the tropics.

Summary: Questions regarding the vertical structure of temperature trends, particularly within the tropical troposphere, have been difficult to resolve due to observational uncertainties and discrepancies between climate model simulations and observations. A recent paper in GRL by Fu et al. (2011) compared satellite observations of tropical tropospheric temperature trends with several dozen climate model simulations and found that the models exaggerate the greater warming in the upper troposphere than in the lower troposphere. This study repeats the analysis of Fu et al. but using radiosonde observations rather than satellite observations. The radiosonde analysis partially confirms the earlier results, but leaves open the possibility that models are actually consistent with observations, within the uncertainties of both.

Expected Publication Date: November 2012



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3. OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

3a. Title: Challenges of a Sustained Climate Observing System

Journal: WCRP OSC Monograph; Chapter found in: G.R. Asrar and J.W. Hurrell, Eds. *Springer*, in press.

Authors: K. E. Trenberth, R. A. Anthes, A. Belward, **O. Brown (Cooperative Institute for Climate and Satellites-North Carolina)**, **T. Habermann (NESDIS/NGDC)**, **T. R. Karl (NESDIS/NCDC)**, S. Running, B. Ryan, **M. Tanner (NESDIS/NCDC)**, and B. Wielicki

Significance:

- The authors identify and discuss the continued need for earth observations from local to global scales.
- The authors also discuss the challenges that remain in providing adequate analysis, processing, meta-data, archival, access, and management of the resulting data and the data products available to scientists and policymakers.

Summary: Observations of planet Earth and especially all climate system components and forcings are increasingly needed for planning and informed decision making related to climate services in the broadest sense. Although significant progress has been made, much more remains to be done to create and develop a fully functional and dependable climate observing system. The ultimate goal should be to acquire climate observations of sufficient quality and coverage, and analyze them into products for multiple purposes to inform decisions for mitigation, adaptation, assessing vulnerability and impacts, possible geo-engineering, and predicting climate variability and change and their consequences. Major challenges still exist in producing a continuous climate record, and in collecting, analyzing, and managing data and data products generated by satellites and other remote sensing platforms.

Expected publication date: December 2013



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3b. Title: National Summary of NOAA's Shallow-water Benthic Habitat Mapping of U.S. Coral Reef Ecosystems

Publication: NOAA Technical Memorandum NOS NCCOS 122

Authors: M. Monaco, S. M. Anderson, T. A. Battista, A. M. Clarke, M. S. Kendall, S. O. Rohmann, and L. M. Wedding (NOS/NCCOS)

Significance: In 2000, the United States Coral Reef Task Force charged NOAA with leading federal efforts to produce comprehensive digital maps of all U.S. shallow-water (0-30 meters) coral reef ecosystem habitats. This report summarizes the outcomes of NOAA's strides in attaining this goal in a singular report. The document is an entryway to a wealth of NOAA mapping data that identify the location and distribution of key seafloor habitats (i.e., coral reefs, seagrass beds, etc.) in areas across the Atlantic, U.S. Caribbean and Pacific. Managers, scientists and policy makers can continue use these tools to make informed ecosystem-based management decisions to conserve the nation's coral reef ecosystems.

Expected publication date: December 2012



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3c. Title: An Integrated Biogeographic Assessment of Reef Fish Populations and Fisheries in Dry Tortugas: Effects of No-take Reserves

Publications: NOAA Technical Memorandum NOS NCCOS 111

Authors: C. F.G. Jeffrey, V. R. Leeworthy, M. E. Monaco, G. Piniak, M. Fonseca (NOS/NCCOS)

Significance: The integration and analysis of historical and current biological, physical and economic data represents the first effort to evaluate the impact reserve designation has on both the living marine resources of the Tortugas region and the people whose livelihoods are connected to them. Findings from the document provide area managers and decision makers with additional information to support and guide ecosystem-based management decisions that will have a lasting impact on the living marine resources of the Dry Tortugas.

Summary: In 2001, state and federal agencies established the Tortugas Ecological Reserve to protect extensive, unspoiled shallow-water coral reefs that support a wide variety of marine life in the region. The objectives of this work were to: 1) conduct an integrated assessment of the seafloor habitat and reef fishes of the Tortugas Ecological Reserve; 2) assess the effectiveness of the Tortugas Ecological Reserve in protecting resources and providing economic benefits; and 3) assess stressors and conditions of the adjacent Dry Tortugas National Park (DTNP). Researchers found that the Tortugas region likely experienced an early increase in the biomass of exploited fish species within a few years of the reserve implementation. Analysis of socioeconomic data revealed that people employed in commercial fishing activities did not experience any financial loss due to the implementation of the reserve in the short-term. Reef fish catch from the Tortugas area increased pre to post implementation and continues on an upward trend. Pre and post analysis of three important fisheries—shrimp, lobster and King Mackerel—again show no losses to commercial fishermen as a result of the reserve. Recreational fisheries, likewise, did not experience any financial losses due to the implementation of the reserve. Finally, there is little evidence to suggest there has been a negative or positive economic impact of reserve designation on charter fishing and diving operations that operated in the study area prior to its creation, or that the reserve has been an economic barrier to businesses.

Expected Publication Date: November 2012



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3d. Title: Shallow-water benthic habitats of Southwest Puerto Rico

Publications: NOAA Technical Memorandum

Authors: L. J. Bauer, K. Edwards, M. S. Kendall, K. K.W. Roberson, T. Battista (NOS/NCCOS)

Significance: Updated fine-scale benthic habitat maps will support Guanica Bay restoration efforts and allow for potential future changes in the spatial distribution of habitats and benthic cover to be evaluated following completion of the restoration activities. Additionally, this work supports ongoing efforts to characterize benthic habitats and human uses in Marine Protected Areas (MPAs) of Puerto Rico, particularly those identified by the Department of Natural and Environmental Resources (DNER) as priority watershed areas. A total of 343.11 km² of marine habitat were mapped in the entire study area. The Belvedere study region accounted for 48.58 km² of this total, while the Parguera/Guánica region accounted for the remaining 293.27 km².

Summary: This report describes the creation and assessment of benthic habitat maps for shallow-water (<30m) marine environments of the Guánica/Parguera and Belvedere regions in Southwest Puerto Rico (SWPR). The objective was to provide spatially-explicit information on the habitat types, biological cover and live coral cover of the region's coral reef ecosystem. These fine-scale habitat maps, generated by interpretation of 2010 satellite imagery, provide an update of NOAA's previous digital maps of the U.S. Caribbean.

Expected publication date: November 2012